FIG. 1.

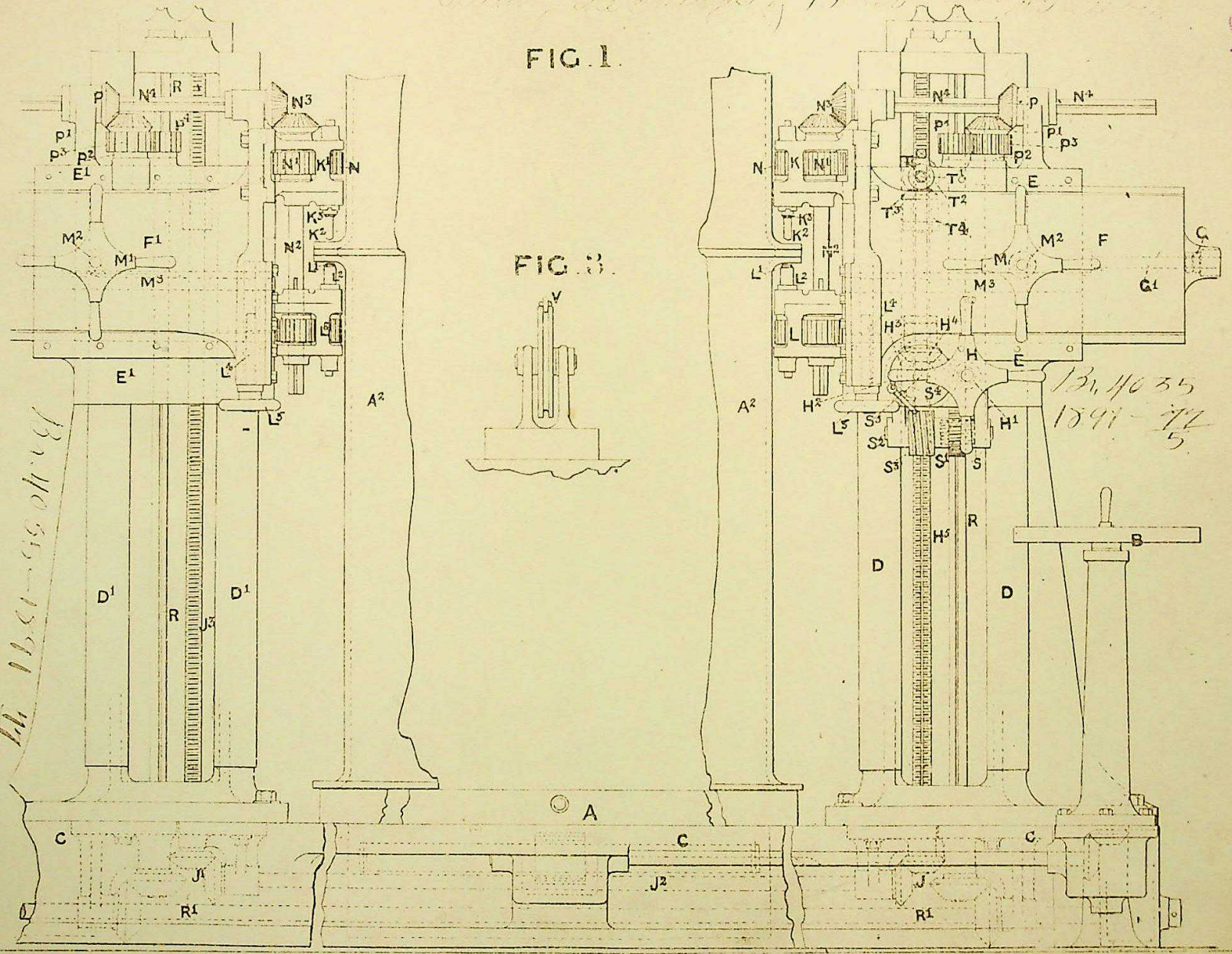

FIG. 3.

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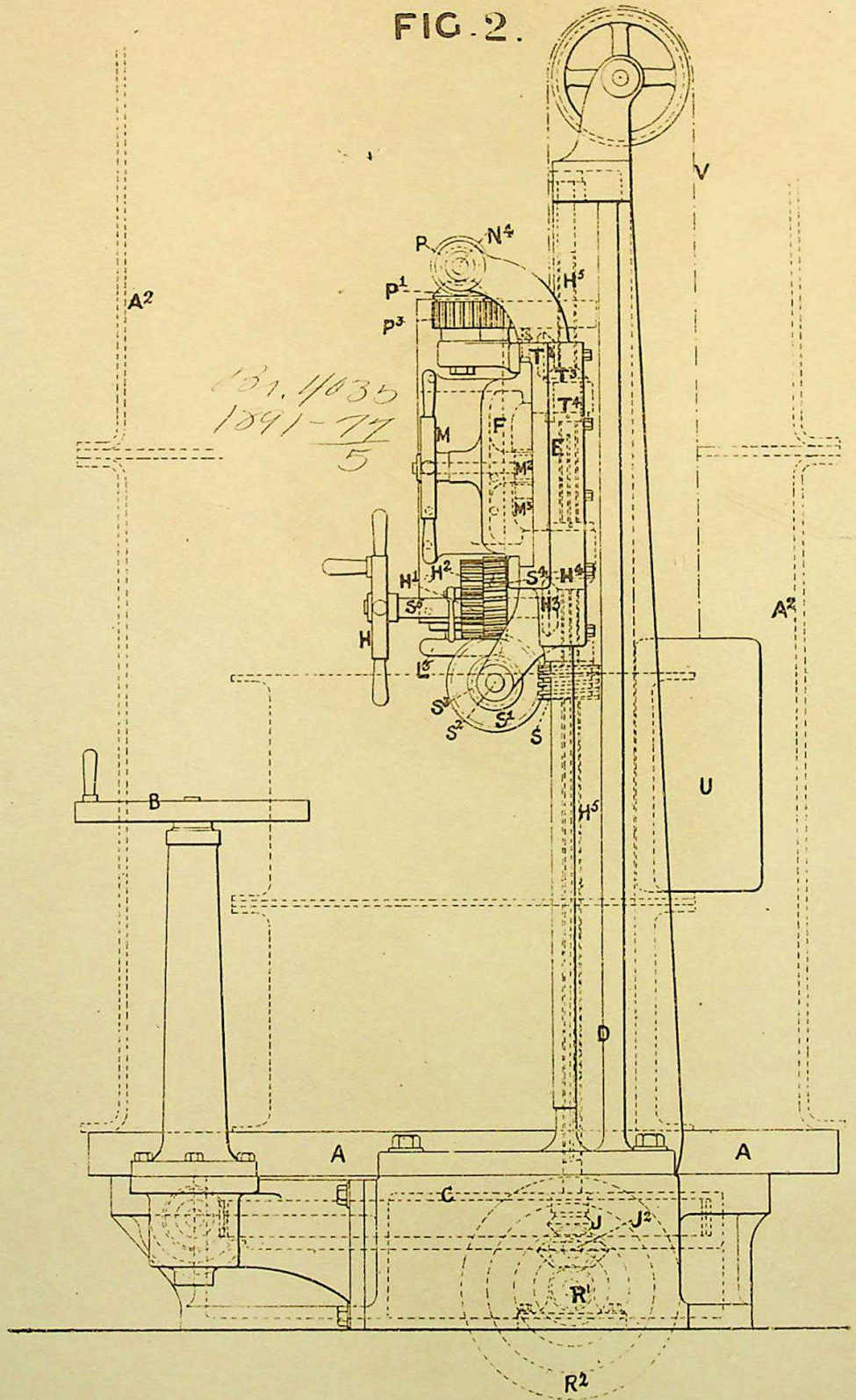
FIG. 2.



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A.D. 1891. March 6. N° 1035.
BOOTH & another's COMPLETE SPECIFICATION.

Vacuum Photo-Litho

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77. METAL WORKING,
Drilling Machines.

N° 4035 A.D. 1891

Date of Application, 6th Mar., 1891—Accepted, 9th May, 1891

COMPLETE SPECIFICATION.

Improvements in the Method of and Apparatus for Drilling the Flanges of Boiler Flues or Tubes.

We GEORGE BOOTH and GEORGE PICKERSGILL of the firm of Messieurs George Booth and Co. of the Central Iron Works, Halifax in the County of York, Engineers and Machine Tool Makers do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

The object of our invention is, by a special construction of machinery to be enabled to drill the holes required in the flanges of the tubes of boiler flues, when two of such tubes are in position with the annular metal ring or washer between them ; and so drill through the three thicknesses of metal at one operation, thereby ensuring the holes in plates being drilled accurately and at the same time to countersink the said holes.

Also to so construct the drill holders and their slides and bearings so that when they become worn, they can be taken off and renewed.

Such parts are preferably made of special metal, such as steel, phosphor bronze and gun metal so that the greatest possible strength is obtained in the least compass.

Also that both sets of drills can be adjusted or manipulated simultaneously or they can be worked independently.

DESCRIPTION OF DRAWINGS.

Fig. 1. is a front elevation of machine for drilling the flanges of tubes for boiler flues, with tubes and both drills in position.

Fig. 2. is a side elevation of Fig. 1.

Fig. 3. is a detail of pulley for chain and balance weight.

The flues A^2 whilst being drilled are fixed on a circular table A. which is fitted with a series of ordinary chuck jaws, which are moved simultaneously.

The circular table A is rotated by a hand wheel B. which is (when required) connected with the ordinary dividing motion, for pitching the holes to be drilled, the said table resting upon a suitable bed C.

At each end of this bed C is a vertical standard D. D^1, upon these standards is fixed an adjustable vertical slide or saddle E. E^1, which carries an adjustable horizontal slide F. F^1, for adjusting the drills in position for drilling the said tubes or flues A^2 ; an adjustable stop nut G. is placed upon a screwed rod G^1 attached to the slide E, in order (after adjusting the drills) to be set in any required position for drilling.

The adjustable slide E is adjustable by means of a hand wheel or cross handle H operating a pinion wheel H^1, gearing with a spur wheel H^2, which in turn operates a bevel wheel H^3, such bevel wheel operating a bevel wheel H^4, with a key sliding upon the grooved vertical screw H^5 and at the same time adjusting or feeding the lower countersinking drills L^1. When such drills are required to be withdrawn the motion is reversed, the slide E being adjusted simultaneously by means of mitre wheels J. J^1, shaft J^2, and vertical screw J^3 on standard D^1, receiving their motion from the vertical screw H^5, and cross handle H.

Upon the horizontal slides F and F^1 are fixed steel headstocks K. K^1 for drill spindles K^2, upon the drill spindle nose is fitted or attached a rosebit K^3 for countersinking the holes when drilled.

Also upon the lower part of the slides F. F^1 is fixed an adjustable steel headstock L. L^3, similar to the above, which also carries a rosebit L^1, on the point of the spindle L^2, for countersinking the hole on the underneath flange.

[*Price 6d.*]

The headstocks L. L^3, being adjustable vertically (to suit various lengths of drills used by the upper headstocks K, K^1,) by means of hand wheels L^5, and screws L^4, upon the horizontal slides F and F^1.

For withdrawing the drills clear of the flues when drilled or finished, we employ cross handles or hand wheels M, M^1, which by means of pinions M^2 gearing with a rack M^3, fixed to the slide E, withdraws the slides F F^1, carrying the headstocks and drill spindles clear of the flues while being changed.

The drills K^2 receive their motion from a steel pinion N, keyed on the drill spindle, such pinion gears with a spur wheel N^1, upon a vertical shaft N^2; this shaft is driven by mitre wheels N^3, and short horizontal shaft N^4.

This horizontal shaft N^4, is driven by a mitre wheel P, gearing with a mitre wheel P^1, upon a stud P^2; upon this stud is also a spur wheel or pinion P^3, gearing with a pinion P^4, on a vertical shaft R; this shaft R is driven (by means of bevel gear wheels) by the main or other driving shaft R^1, preferably by cone pulleys R^2, fixed in any suitable position.

A self acting feed motion is applied to both saddles E E^1 from the vertical shaft R, by means of worm S, upon the shaft R, gearing with a worm wheel S^1 on a short shaft S^2; this worm wheel S^1 driving a worm S^3 on the same shaft, gearing into a worm wheel S^4 upon another short shaft S^5, thereby operating bevel gearing on the screwed shaft H^5, thus giving a suitable self acting traverse to both drills.

Upon the upper portion of the saddle or slide E, is placed a short shaft T with square T^1 for handle, on the inner end of which is keyed a small mitre wheel T^2, gearing with a similar wheel T^3 on a revolving or adjustable nut T^4, on the screwed shaft H^5, by this arrangement the lengths of the various drills may be adjusted.

Each saddle is provided with a balance weight U and chain V for compensating the weight of the saddles upon the standards.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A drilling machine for drilling the flanges and washers of tubes of boiler flues in position and countersinking the said flanges at one operation for the purposes described.

2. Constructing the drill holders, slides, and bearings (for drilling the flanges of tubes in position) preferably of steel, phosphor bronze, or gun metal in the manner and for the purpose such as shown and described.

3. Operating and adjusting the drills, slides, and headstocks, upon the opposite sides of the flanges of tubes of boiler flues simultaneously or independently as and for the purposes substantially as shown and described.

4. The general arrangement and construction of apparatus in the manner and for the purposes substantially such as shown and described.

Dated this Fifth day of March 1891.

JOHN E. WALSH,
Crossley Street, Halifax, Agent for the Applicants.

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